

## Renal Functional Status in Lepromatous Leprosy<sup>1</sup>

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Renal functional impairment in leprosy has been reported in the recent past (3, 5, 6, 14). The impairment has been alleged to be due to erythema nodosum leprosum (ENL) (3). In the present study, renal involvement in leprosy with particular reference to its relation to ENL has been investigated.

### MATERIALS AND METHODS

One hundred and twenty-two patients with lepromatous leprosy with or without ENL were studied. These patients were obtained from the Leprosy Mission Hospital, Naini, and S. R. N. Hospital, Allahabad (India). Bacteriological Indexes (BI) were determined by Ridley's method (10). Twenty-three age-matched healthy individuals, usually from among the attendants of the patients and belonging to the same socio-economic status as the patients, were also studied as controls.

Renal functional status was evaluated by urinalysis (protein, sugar, and microscopic examination), serum and urinary creatinine, endogenous creatinine clearance, blood urea, and 24 hr urinary protein excretion. Blood sugar determinations were made in all cases to exclude diabetes mellitus.

Patients suffering from diseases which commonly affect renal function, namely diabetes mellitus, tuberculosis, urinary tract infection, and hypertension, were excluded from the study.

### RESULTS

The patients were divided into three groups: lepromatous leprosy with ENL (Group A), lepromatous leprosy with a past history of ENL (Group B), and uncomplicated lepromatous leprosy (Group C). Group D consisted of the healthy control subjects. The number of cases in the various groups, their mean age, duration of illness, Bacteriological Index, and abnormal urinary findings are shown in Table 1.

The number of ENL attacks ranged from one to 17 in Group A. Out of 44 patients in this group, 32 experienced fewer than five, 10 cases had five to 10, and two had more than 10 ENL attacks. The duration of these attacks ranged from 7 to 45 days. Many of these patients were on symptomatic treatment at the time of study although some patients had to be given corticosteroids and clofazimine (Lamprene®). Similarly, the number of ENL attacks in patients of Group B varied from one to 25. Out of 45 patients belonging to this group, 34 had fewer than five, seven cases had five to 10, and four had more than 10 ENL attacks.

Renal impairment was found to be independent of the duration of illness or the Bacteriological Index (BI) in the various groups with leprosy. The BI was highest in Group A and varied from 1.3 to 5.3 with a mean of 3.46. In Groups B and C the BI ranged from 0.7 to 5.3 with a mean of 2.79 and from 0.3 to 4.6 with a mean of 2.38, respectively. The duration of illness in the various groups was found to vary from 4 months to 30 years (Table 1).

Proteinuria, microscopic hematuria, and the presence of red blood cell and granular casts in the urinary sediment were most commonly seen in patients of Group A, followed by Groups B and C, respectively. The amount of proteinuria in 24 hr was also maximal in Group A.

The results of blood urea, serum creati-

<sup>1</sup> Received for publication on 8 May 1980; accepted for publication in revised form on 25 November 1980.

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TABLE 1. Number of cases, mean age, duration of illness, Bacteriological Index (BI), and abnormal urinary findings.

Group	Type of subject	No. of cases	Age in years (range)	Duration of illness in years (range)	BI	Percentage of cases showing abnormal urinary findings			Proteinuria in g in 24 hr (range)
						Microscopic hematuria <sup>a</sup>	Casts <sup>b</sup>	Proteinuria <sup>c</sup>	
A	Lepromatous leprosy with ENL (reactive cases)	44	35.6 (12-65)	7.56 (0.3-24)	3.46 (1.3-5.3)	43.2	22.7	65.9	0.76 (0.23-4.8)
B	Lepromatous leprosy with past history of ENL (quiescent cases) <sup>d</sup>	45	38.7 (16-60)	10.25 (1-25)	2.79 (0.7-5.3)	8.9	22.2	44.4	0.73 (0.22-3.0)
C	Uncomplicated lepromatous leprosy	33	42.9 (18-70)	10.60 (1-30)	2.38 (0.3-4.6)	0	18.2	42.4	0.64 (0.27-1.23)
D	Normal healthy controls	23	38.4 (16-58)	—	—	0	0	0	0.15

<sup>a</sup> More than three red blood cells per high power field.

<sup>b</sup> Mostly red blood cell and granular casts (two to eight per high power field).

<sup>c</sup> Protein excretion more than 0.2 g in 24 hr.

<sup>d</sup> Subsidence of ENL at least 3 to 4 weeks prior to the study.

TABLE 2. Mean ( $\pm$ S.D.) values of blood urea, serum creatinine, and endogenous creatinine clearance (ECC) in various groups of leprosy patients and control subjects.

Group	No. of cases	ECC (ml per min)	Serum creatinine (mg per 100 ml)	Blood urea (mg per 100 ml)
A	44	55.62 <sup>a,c</sup> ( $\pm$ 18.96)	1.14 <sup>a</sup> ( $\pm$ 0.35)	27.36 ( $\pm$ 10.37)
B	45	71.22 <sup>a</sup> ( $\pm$ 24.05)	0.93 ( $\pm$ 0.22)	27.20 ( $\pm$ 9.40)
C	33	79.05 <sup>b</sup> ( $\pm$ 20.61)	0.88 ( $\pm$ 0.19)	22.73 ( $\pm$ 3.73)
D (Controls)	23	96.26 ( $\pm$ 22.65)	0.83 ( $\pm$ 0.18)	23.65 ( $\pm$ 3.98)

<sup>a</sup> Significantly less than Group D, Student's *t* test,  $p < 0.001$ .

<sup>b</sup> Significantly less than Group D, Student's *t* test,  $p < 0.01$ .

<sup>c</sup> Significantly less than both Group B and Group C, Student's *t* test,  $p < 0.001$ .

nine, and endogenous creatinine clearance determinations are presented in Table 2. No statistically significant changes were seen in the blood urea levels. Serum creatinine was statistically significantly raised only in patients of Group A. Endogenous creatinine clearances were significantly diminished in all three groups of leprosy patients in comparison to healthy control subjects (Table 2). In patients of Group A, the reduction in endogenous creatinine clearance was also significant when compared to Group B ( $p < 0.001$ ) and Group C ( $p < 0.001$ ). The differences between Groups B and C were not significant.

Evidence of renal functional involvement on the basis of one or more altered parameters was observed in 84.1, 66.6, and 54.5 percent of the patients in Groups A, B, and C, respectively.

#### DISCUSSION

*Mycobacterium leprae* ordinarily does not invade the renal parenchyma, but the kidney of a leprosy patient may be the site of considerable functional and structural impairment. The impairment has been alleged to be due to circulating immune complexes, which are frequently associated with ENL (4).

Proteinuria was one of the common presentations in this study. It was observed in 65.9% of reactive, 44.4% of quiescent, and 42.4% of uncomplicated lepromatous leprosy patients. Brusco and Masanti (1) reported proteinuria in 59.0% of reactive and 26.0% of quiescent cases while in the series of Thomas, *et al.* (14), the respective figures were 34.0% and 10.0%. On the other hand, Satyanarayana, *et al.* (11) and Gutman, *et al.* (6) did not observe proteinuria in any case in their studies of 79 and 47 patients, respectively.

Microscopic hematuria occurred in 43.2% and 8.9% of cases with lepromatous leprosy with ENL (Group A) and with a past history of ENL (Group B), respectively. No hematuria was detected in uncomplicated cases (Group C). Thomas, *et al.* (14) reported microscopic hematuria in 45.7% of reactive, 27.0% of quiescent, and 13.0% of uncomplicated leprosy cases. Johnny, *et al.* (7) in their study of 35 cases (29 lepromatous and six borderline) detected hematuria in 14.3% of cases. Contrary to the above findings, Shuttleworth and Ross (12) reported occasional red blood cells in the urine whereas Mittal, *et al.* (8) did not find microscopic hematuria in any case.

Casts were detected in 22.7%, 22.2% and 18.2% of cases in Groups A, B, and C, respectively. The cases were usually of the granular type. Thomas, *et al.* (14) observed casts in 34.2% of reactive patients and 10% of cases of quiescent disease. None was found in uncomplicated patients. Shuttleworth and Ross (12) reported casts in 38.5% of cases in the reactive phase. Reddy, *et al.* (9) could not demonstrate any casts in the urine of their patients.

Although the urinary findings showed renal involvement of varying grades in the different groups of lepromatous leprosy patients, no significant increases in blood urea were observed. Similar observations have been made by other workers (7, 8, 14).

Date, *et al.* (2) reported raised serum creatinine in two out of eight reactive lepromatous patients. In the present study, serum creatinine was significantly increased in reactive cases but was not significantly elevated in quiescent or uncomplicated patients. Thomas, *et al.* (14) and Gutman, *et*

*al.* (6) have reported normal serum creatinine even in reactive cases.

Endogenous creatinine clearance was found to be significantly depressed in all three groups with mean values ( $\pm$ S.D.) of  $55.62 \pm 18.96$ ,  $71.22 \pm 24.05$ , and  $79.05 \pm 20.61$  ml per min in Groups A, B, and C, respectively. This observation is in accordance with other workers (2, 7, 13, 14). On the other hand, Gutman, *et al.* (6) did not demonstrate any significant changes.

In the present study, some evidence of impaired renal function was observed in 84.1% of reactive, 66.6% of quiescent, and 54.4% of cases of uncomplicated lepromatous leprosy. The higher incidence of renal functional impairment observed during the reactional and quiescent phases of lepromatous leprosy could be attributed to ENL. Renal functional impairment was found to be independent of the duration of illness and the Bacteriological Index.

#### SUMMARY

Renal functional status was evaluated in 122 patients with lepromatous leprosy. Renal functions were found to be markedly impaired in patients with erythema nodosum leprosum (ENL) in the active or quiescent phases. Although uncomplicated lepromatous leprosy patients did show significant renal impairment as compared to healthy controls, the degree of impairment was less than that of the reactive cases. Diminished endogenous creatinine clearance and proteinuria were the common abnormalities detected. Serum creatinine was significantly increased only in reactive cases. Blood urea was found to be marginally increased in a few patients although not to a statistically significant degree. Renal involvement did not bear any relation to the duration of illness or to the Bacteriological Index.

#### RESUMEN

Se evaluó el estado de la función renal en 122 pacientes con lepra lepromatosa. El funcionamiento renal se encontró marcadamente afectado en los pacientes con eritema nodoso leproso (ENL) tanto en la fase activa como en la fase quiescente. Aunque los pacientes con lepra lepromatosa no complicada mostraron cierto grado de afección renal, el grado de alteración fue menor que en los casos reaccionales. Las anomalías más comunes fueron una deprimida

depuración de creatinina endógena, y proteinuria. La creatinina sérica estuvo significativamente incrementada sólo en los casos reactivos. La urea sanguínea estuvo ligeramente aumentada en algunos pacientes, aunque no a un nivel estadísticamente significativo. La afección renal no mostró ninguna relación con la duración de la enfermedad o con el índice bacteriológico.

#### RÉSUMÉ

L'état fonctionnel du rein a été évalué chez 122 malades atteints de lèpre lépromateuse. On a observé que les fonctions rénales étaient fortement atteintes chez les malades présentant un érythème noueux lépreux (ENL) dans des phases actives ou au repos. Les malades souffrant de lèpre lépromateuse non compliquée présentent une atteinte rénale notable, par comparaison à des sujets témoins en bonne santé. Néanmoins, l'atteinte était moins sévère chez ces malades lépromateux, que chez ceux présentant des réactions. Les anomalies les plus communément mises en évidence consistaient en une diminution du "clearance" de la créatinine endogène et en une protéinurie. La créatinine sérique était significativement augmentée dans les cas réactionnels, et seulement dans ceux-ci. On a observé une augmentation marginale de l'urée dans le sang chez quelques malades, encore que cette augmentation ne soit pas statistiquement significative. L'atteinte rénale n'était nullement en relation avec la durée de la maladie ou l'Index Bactériologique.

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